

A Study on Implementation of Intelligent Transport System to Bus Rapid Transit System (BRTS), Bengaluru - A Framework To Improve Present Public Transport

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Abstract— Road traffic congestion is a recurring problem not only in India but worldwide. In many states traffic is being a major hurdle due to urbanization and auto-mobilization. Karnataka is one of such states with fast growing cities such as Bengaluru have wide scope of rapid growth in economy and population; there is a raising trend of traffic congestion resulting in delay in reaching the destination. Bengaluru city has experienced a phenomenal growth in vehicle population in recent years due to city expansion, urbanization and independent culture.

According to survey; the time taken to travel the same distance has seen a regular increase as Bengaluru's traffic-choked roads are seeing an addition of roughly 5lakh vehicles each financial year, with the total number of vehicles in Bengaluru breaching the 60.59lakh mark this year. By February2016, the number of 'non-transport' vehicles such as two-wheelers and cars in the city had reached 54.67lakh. According to Transport Department, 41.86lakh two-wheelers dominated the city's roads, followed by 11.8lakh cars. The number of transport vehicles stands at over 5.91lakh, 1.05 lakh taxis and 40,365 Buses. The city has seen a steady increase in the number of vehicles being registered from 41.56lakh in March2012 to 55.59lakh in March2015, and now over 60.59lakh by February2016. According to Transport Department at least 1lakh more vehicles had been added to this tally March2016. Statistics clearly indicate that the number of public transport is less and people opt for private vehicles as there is no proper arrival and departure times, delay due to unpredictable traffic, connectivity to exact destinations, convenience and reliability issues.

With Bengaluru's 12.33 million population bus transport is the most economical and affordable transport system from societal perspective. The rapid increase in the number of vehicles on the road has escalated the need for managing traffic flow efficiently to optimize utilization of road capacity. Public transport has huge delays to each stop due to traffic congestion during peak hours. A well structured unique lane for BRTS can provide a high level of mobility, on time arrival, departure, reduction in the waiting time of passengers. The paper is a proposed idea for controlling and managing peak time traffic. With the trend of worldwide urbanization, an increasing number of vehicles are swarming into city road networks of

limited capacity, leading to excessive increase of traffic congestion. As a result the major conglomerate junctions are operating over the capacity and average journey speeds on some of the key roads in the Central Area are lower than 10kmph in the peak hour. Therefore it has become necessary to establish plans for efficient traffic management in Bengaluru. The target of the study is to make uniform travel time for the people at both peak and non peak hours. This paper attempts to understand the application of Intelligent Transport System (ITS) in Indian context with case studies as a solution to the current traffic management practices. The use of modern amenities and efficient data communication has now become the basic requirements of all the services.

Index Terms— BRTS, Urbanization, Sustainable transport system, Mobility, Public Transport.

I. INTRODUCTION

Transportation is crucial for any developing country [1]. The functioning of urban areas will be efficient by providing better access and quality of transportation. It is clearly seen from the figure 1 that for transporting the same number of passengers a bus takes the least space when compared to personal vehicle or cycle. So a major working population of Bengaluru depends on public bus transport.

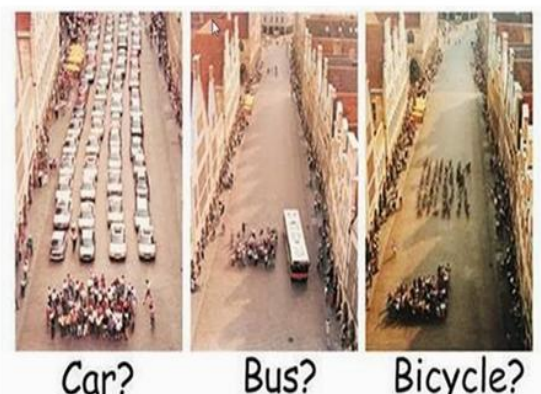


Figure 1: Amount of space required to transport same number of passengers by different modes

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With the growth, the need for mobility and selection of the transport increases, leading to increase in traffic congestions. People's personal selections and freedom expressed in possession and use of customized vehicles has increased traffic congestions [2]. The present public transport striving hard to structure service varieties in satisfying dynamic demand with various patterns. Convenience of BRTS can increase speeds and ease increasing levels of congestion.

Improving the roads of Bengaluru and structuring the movement of vehicles is the scope of future. The new metro framework does not serve in much traffic congestion areas thus the scope of separate lane BRTS is viable.

Majorly, traffic is being controlled by the installation of Intelligent Systems. Intelligent Transport System (ITS) is one of such computerised system with various applications related with vehicle transportations. ITS improves transportation safety and quality and enhances productivity through the employment of advanced communications technologies.

As per the Indian road condition analysis there are ample of reasons that contribute to the increase in the level of congestions on the roads. Foremost being the fact that most of the roads are shared by differing types of vehicles with their non-uniform movements such as 2-wheelers, 3-wheelers, 4 wheelers, buses, goods carriers, non-motorized vehicles and sometimes crossing of roads by pedestrians as well. All these vehicles have different start times so the signals are made for longer durations also in peak hours vehicles stop for more than 1 signal at each intersection there by increasing the travel time by many folds

In developed nations the precise lane is supposed and the lane discipline is enforced leading to the less probability of initial delays.

II. OBJECTIVE

- Make uniform travel time for passengers in buses during peak and non-peak hours.
- Provide a comparative analysis of scope of BRTS with existence of Metro in Bengaluru.
- Integrate BRT in such a way to help reduce traffic congestion.
- Equalise start time for vehicles which stop at signals.
- Integrate bus stops and signal stops to cut down total route time.

III. SCOPE OF THE STUDY

- Sample data between Nayandahalli to DG petrol Bunk.
- Distance of 5KM and 8 bus stops.
- Collection of necessary data from 6 intersections.
- Determine the average travel time, queue lengths and delays on the selected road.
- Carry out present status survey on taken route.
- Review of the literature for different BRTS in different country
- Analysis of data required study the ultimate impact on BRTS.

IV. NEED FOR THE STUDY

Problem Definition

The heterogeneous traffic-flow prevailing on Indian roads, with variety of vehicles such as cars, autos, and buses find it difficult to channelize their way through the traffic and is subjected to frequent acceleration and retardation, resulting in lower speed and discomfort to both passengers as well as drivers.[3] They conjointly lead to tremendous delay and uncertainty to bus passengers and, consequently, the amount of service of buses gets reduced significantly creating buses a less engaging mode of transport. Hence, there's a comprehensive need to study the matter in detail and notice ways that and means to boost the amount of service of bus transit. The road traffic in Bengaluru has grown rapidly within the recent past, creating the offered transport infrastructure inadequate.

There is an increase of travel time from 12 min to 45 min during non-peak and peak hours. The passengers find great difficulty in waiting at the bus stops for long duration. Buses often block the signals by stopping for boarding of passengers at junctions and cause a heck of congestion. Making others vehicles stop for another signal. Because of the fact that the modern transport facility is expensive to expand there is necessity to come up with different solutions for the existing problems.

V. LITERATURE REVIEW

Planning of transportation is coming up with few method whereby transit is introduced or the system that is existing is upgraded towards the betterment of the society thus by making the system perform numerous aspects such as:

1. Incorporating existing roads.
2. To avoid the recurring losses incurred by travelling minimum distances with minimum time.
3. To make a sustainable city functional during peak hours and operative hours.
4. To relate the present system and suggested system of transportation. [3]

Strategies can be developed to best utilize the obtainable infrastructure facilities, road's lengths and breadths in such the way that the carrying capacity of the road to carry number of people can be increased.

Buses provided with exclusive road lane and areas that facilitate the starting time for busses at signals. Leading to faster movement of more vehicles at each signal. Also the route time for busses at peak hours and non-peak hours is nearly same. This reduces over all travel time for passengers at peak time. [4]

In addition to this to reduce the delays and stoppages is to integrate a bus stop and signal in such a way that the time for stopping at signals matches with the boarding and de-boarding time of passengers. Saving the entire boarding time at each stop.

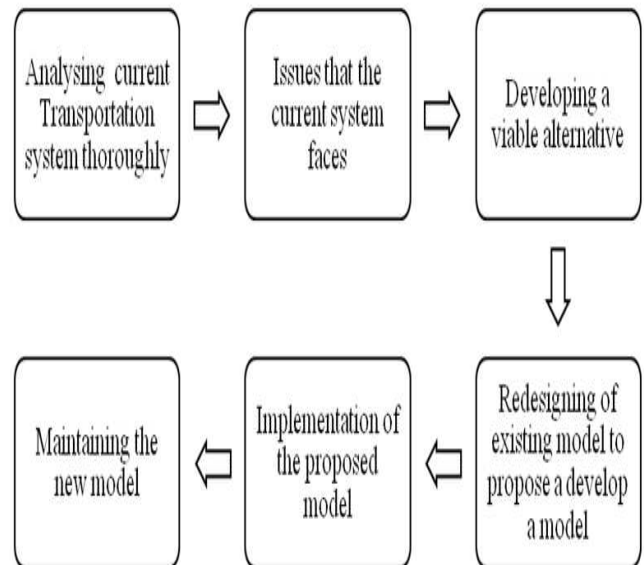
The road chaos due to congestion which might be controlled .the integration of bus stops and signals may be done by using an experiment as done by J.Biagioni et al. The experiment is done by setting an application on bus so that going after the bus is simple. This application will find a bus and send the information to the central server to trace down its time of arrival to its next stop. This makes the server to keep record of every single bus on the track and scheduled time of arrival. At the stop the user will get all the knowledge concerning the several bus arrivals at the spot.

The stops at signals to be covered in stoppages for boarding!

- Streamlining of bus route timings.
- BMTC vs. BRTS
- Route time length during peak and non-peak hours are equalised

As the initial price of construction for a metro-rail is incredibly high as compared to the BRT systems, BRTS was thought of as a viable option. Also, the development of metros involves a lot of inconvenience to the general public and to business, and for an extended time as compared to the BRTS construction .

VI. METHODOLOGY



VII. ANALYSIS AND DATA COLLECTION

Table1: Schedule of buses from Nyandahalli to DG Petrol Bunk

Stop Name	Distance	Time(min)																			
		5.00AM	5.40AM	6.35AM	7.12AM	8.00AM	9.25AM	10.37AM	11.15AM	12.05PM	1.18PM	2.30PM	3.15PM	4.05PM	4.40PM	5.00PM	5.35PM	6.15PM	7.10PM	8.15PM	9.10PM
	Total time(min)	10	12	11	18	40	30	28	19	21	15	19	19	28	35	40	44	56	55	22	18
Nyandahalli	0m																				
Veerbhadrnagar	800m	2	2	2	2	3	2	2	3	3	2	2	3	4	2	3	3	6	6	4	1
PES College	550m	1	1	1	3	7	4	4	3	4	3	2	3	2	6	10	10	10	8	3	1
Jn of outer ring road	1000m	3	3	3	3	9	8	8	3	3	4	5	5	10	9	8	8	17	14	3	3
Janta bazar bus stop	500m	1	1	1	2	4	2	2	2	2	2	2	2	2	3	2	3	3	5	4	6
Khatriguppe Bus Sto	550m	1	2	1	3	4	4	3	3	3	1	3	2	3	4	3	4	4	4	3	2
Kamaya Talkies	400m	1	1	1	2	7	5	4	2	2	1	2	2	3	6	9	10	10	12	2	3
DG Petrol Bunk	800m	1	2	2	3	6	5	5	3	4	2	3	2	4	5	5	6	6	6	3	2

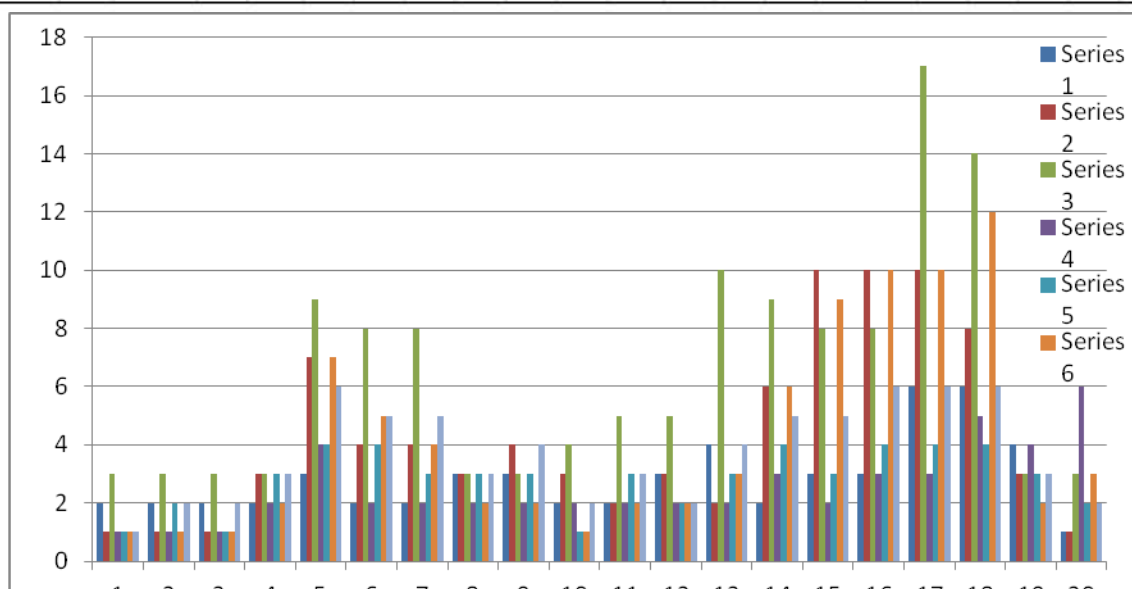


Figure 2: Individual timings of departure and arrival of buses from Nyandahalli to DG Petrol Bunk

According to personal survey in the route considered it was observed that there is large difference between non traffic and traffic hours in total trip time.

Table 1 shows the Schedule of buses from Nyandahalli to DG Petrol Bunk, from the table the timing of departure from one bus stop to the next stop is considered. The digital clock is used and it is rounded off to the nearest minute. Figure 2 depicts the graph plotted on considering the individual timings.

VIII. CONCLUSIONS AND SCOPE FOR FUTURE WORK

BRT lane to be made separate other than traffic lane making large interruption on other traffic speed barriers. The frequency of BRTS is less so in spare time in which car or buses should allowed in BRTS lane. Fully automated transport system connecting all the major area in Bengaluru. Intelligent transport system connecting all the most engorged areas in Bengaluru. Viewing the event practices in Bengaluru, the underground construction of metros square measure probably to interfere and endanger the installation, gas pipes, installation lines & under-ground electrical conduits; whereas which will not be the case in BRTS construction. Also, the benefits of the BRTS reaped in shorter time durations are probably found out to be:

- Frequent, reliable and efficient services
- Reduction in traffic jams.
- More reliable public transport system
- More Economic activities nearby surrounding areas of proposed operation
 - Environment friendly
 - High quality and closed bus stops.
 - Increased energy conservation and carbon emissions.
 - Modern and clean buses.
 - Better client service
 - Flexible operating conditions.
- Community areas with corridors.

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